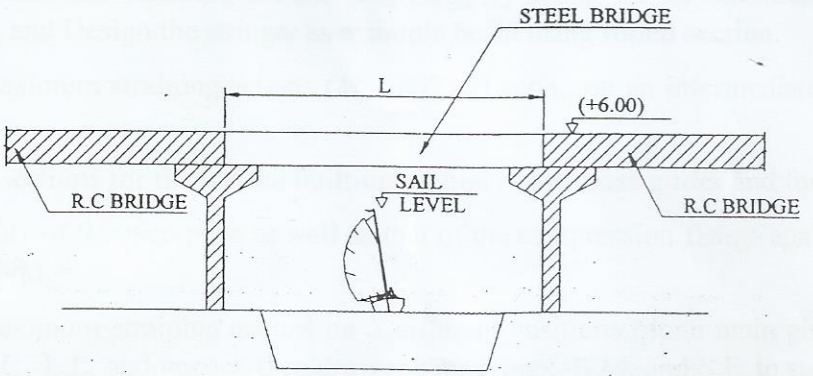
Ain Shams University
Faculty of Engineering
Structural Engineering Department
Course for 4th Structure
First Semester 2015-2016

STEEL STRUCTURES DESIGN (2) (CES 431)

AssignmentNo (1)

PLATE GIRDER ROADWAY BRIDGE

It is required to construct a R.C. floor roadway steel bridge to cross over a water way with a width of "*L*"ms. This steel bridge is joining two existing R.C bridges as shown in figure (Road level of existing bridges is +6.00m and the roadway has a width of "*B*" ms.)



According to the dimensions and levels in the shown table it is required to:

B.N.	*L*	*Sail Level*	*B*	B.N.	*L*	*Sail Level*	*B*	B.N.	*L*	*Sail Level*	*B*	B.N.	*L*	*Sail Level*	*B*
1	20	+4.45	8	**2**	21	+4.35	9	**3**	22	+4.30	10	**4**	23	+4.10	11
5	24	+3.20	12	**6**	25	+3.15	8	**7**	26	+3.10	9	**8**	27	+2.95	10
9	28	+3.20	11	**10**	29	+3.15	12	**11**	30	+3.10	8	**12**	31	+2.95	9
13	32	+2.45	10	**14**	33	+2.35	11	**15**	34	+2.30	12	**16**	35	+2.10	8
17	20	+3.45	8	**18**	21	+3.35	9	**19**	22	+3.30	10	**20**	23	+3.10	11
21	24	+4.20	12	**22**	25	+4.15	8	**23**	26	+4.10	9	**24**	27	+3.95	10
25	28	+2.90	11	**26**	29	+2.85	12	**27**	30	+2.65	8	**28**	31	+2.45	9
29	32	+3.00	10	**30**	33	+2.75	11	**31**	34	+2.90	12	**32**	35	+2.60	8
33	20	+4.45	9	**34**	21	+4.35	10	**35**	22	+4.30	11	**36**	23	+4.10	12
37	24	+3.20	8	**38**	25	+3.15	9	**39**	26	+3.10	10	**40**	27	+2.95	11
41	28	+3.20	12	**42**	29	+3.15	8	**43**	30	+3.10	9	**44**	31	+2.95	10
45	32	+2.45	11	**46**	33	+2.35	12	**47**	34	+2.30	8	**48**	35	+2.10	9
49	20	+3.45	10	**50**	21	+3.35	11	**51**	22	+3.30	12	**52**	23	+3.10	8
53	24	+4.20	9	**54**	25	+4.15	10	**55**	26	+4.10	11	**56**	27	+3.95	12
57	28	+2.90	8	**58**	29	+2.85	9	**59**	30	+2.65	10	**60**	31	+2.45	11
61	32	+3.00	12	**62**	33	+2.75	8	**63**	34	+2.90	9	**64**	35	+2.60	10

1) Choose type of bridge depending on the available height of construction (Deck or Pony Bridge).
2) Draw a general arrangement sheet showing an elevation of the main girder and plans of the different bracing systems to a scale 1:100 together with a cross section of the bridge to a scale 1:50.

Note:
Add a side walk of 1.5 ms on the bridge which have roadway width $B = 8$ and 9 ms,
and add a side walk of 2.0 ms on the bridge which have roadway width $B = 10$, 11 and 12 ms,

General Note
Students having odd B.N. should use St.44 with $F_y = 2.8$ t/cm^2,
while students having even B.N. should use St.52 with $F_y = 3.6$ t/cm^2

3) Calculate the maximum straining actions (M_{d+L}&Q_{d+L}) acting on an intermediate stringer of the roadway bridge, and Design the stringer as a simple beam using rolled section.
4) Calculate the maximum straining actions (M_{d+L}&Q_{d+L}) acting on an intermediate cross girder of the roadway bridge.
5) Design suitable sections for the welded built-up section of the cross girder and for the main girder.
6) Check the stability of the web plate as well as that of the compression flange against lateral buckling of the roadway bridge.
7) Calculate the maximum straining actions on 5 different positions ofone main girder of the roadway bridge due to D.L., L.L. and impact, then draw the max. max. B.M. and S.F. to suitable scale.
8) Determine the lengths of the flange plates of the main girder.
9) Design the vertical and horizontal stiffeners of the main girder.
10) Design the splices of the web plate as well as the bolted field splice of the main girder.
11) Draw to a scale 1:10 the first panel of the M.G. in elevation and plan showing the web splice, the bolted field splice, as well as the connection between cross girder and main girder of the roadway bridge.

Ain Shams University
Faculty of Engineering
Structural Engineering Department
Course for 4th Structure
First Semester 2015-2016

STEEL STRUCTURES DESIGN (2) (CES 431)

AssignmentNo (2)

PLATE GIRDER RAILWAY BRIDGE

It is required to construct an open-timber floor railway bridge whose main girders are plate girders having a theoretical span of "*L*" ms. The bridge has a width of "*B*" ms depending on number of tracks. According to the following table it is required to:

1) Choose type of bridge depending on Assignment No.1 (choose Pony railway bridge if the roadway bridge of Assignment No.1 is Deck, and vice-versa).
2) Draw a general arrangement sheet showing an elevation of the main girder and plans of the different bracing systems to a scale 1:100 together with a cross section of the bridge to a scale 1:50 (scale 1:20 for railway bridge with single track).

Note:
S = single track, D = double tracks, and T = triple tracks.

B.N.	*L*	*Tracks*	B.N.	*L*	*Tracks*	B.N.	*L*	*Tracks*	B.N.	*L*	*Tracks*
1	20	T	**2**	21	D	**3**	22	D	**4**	23	S
5	24	S	**6**	25	T	**7**	26	D	**8**	27	D
9	28	S	**10**	29	S	**11**	30	T	**12**	31	D
13	32	D	**14**	33	S	**15**	34	S	**16**	35	T
17	20	T	**18**	21	D	**19**	22	D	**20**	23	S
21	24	S	**22**	25	T	**23**	26	D	**24**	27	D
25	28	S	**26**	29	S	**27**	30	T	**28**	31	D
29	32	D	**30**	33	S	**31**	34	S	**32**	35	T
33	20	D	**34**	21	S	**35**	22	S	**36**	23	D
37	24	T	**38**	25	D	**39**	26	S	**40**	27	S
41	28	D	**42**	29	T	**43**	30	D	**44**	31	S
45	32	S	**46**	33	D	**47**	34	T	**48**	35	T
49	20	D	**50**	21	S	**51**	22	S	**52**	23	T
53	24	D	**54**	25	D	**55**	26	S	**56**	27	S
57	28	T	**58**	29	D	**59**	30	D	**60**	31	S
61	32	S	**62**	33	T	**63**	34	T	**64**	35	D

General Note

Students having odd B.N. should use St.44 with $F_y = 3.6$ t/cm^2,
while students having even B.N. should use St.52 with $F_y = 2.8$ t/cm^2

1) Calculate the maximum straining actions (M_{d+L}&Q_{d+L}) acting on an intermediate stringer of the railway bridge, and Design the stringer as a continuous beam using rolled section.
2) Calculate the maximum straining actions (M_{d+L}&Q_{d+L}) acting on an intermediate cross girder of the railway bridge.
3) Calculate the maximum straining actions (M_{d+L}&Q_{d+L}) acting on one main girder of the railway bridge.
4) Design suitable sections for the welded built-up section of the cross girder and for the main girder.

Ain Shams University
Faculty of Engineering
Structural Engineering Department
Course for 4th Structure
First Semester 2015-2016

STEEL STRUCTURES DESIGN (2) (CES 431)

AssignmentNo (3)

GENERAL LAYOUT AND DESIGN OF ROADWAY AND RAILWAY TRUSS GIRDER BRIDGE

It is required to construct a R.C. floor roadway bridge/an open-timber floor railway bridge whose main girders are truss girders having a theoretical span of "*L*" ms. The roadway has a width of "*B*" ms, while the width of the railway bridge is depending on number of tracks. According to the following table it is required to:

1) Draw a general arrangement sheet showing an elevation of the truss and plans of the different bracing systems to a scale 1:200 together with a cross section of the bridge to a scale 1:100.
2) Using the influence line; calculate the maximum straining actions acting on all truss members of the bridge due to D.L., L.L. and impact.
3) Design suitable welded built-up sections for all compression members of the truss girder of the bridge.
4) Design suitable welded built-up sections for all tension members of the truss girder of the bridge.
5) Design and draw to scale 1:10 the joints of two and half panelsof the truss girder adjacent the support, and show the splice of chord members as well as a cross section of the bridge.

Note:
For the roadway bridge, add a side walk of 2.0 ms.
For the railway bridge, S = single track, D = double tracks, and T = triple tracks.
Steel Used is ST.52

Bridge type		B.N.	*L*	*B*	B.N.	*L*	*B*	B.N.	*L*	*B*	B.N.	*L*	*B*
Roadway	Deck	1	60	12	2	61	12	3	62	8	4	63	8
	Pony	5	54	10	6	55	10	7	56	12	8	57	12
	Through	9	68	8	10	69	8	11	70	10	12	71	10
	Deck	13	58	12	14	59	12	15	52	10	16	53	10
Railway	Pony	17	50	S	18	51	T	19	52	S	20	53	D
	Through	21	74	D	22	75	S	23	76	S	24	77	T
	Deck	25	58	D	26	59	D	27	60	D	28	61	T
	Pony	29	62	T	30	63	D	31	64	T	32	65	S
Roadway	Through	33	64	8	34	65	8	35	66	10	36	67	10
	Deck	37	74	12	38	75	12	39	76	8	40	77	8
	Pony	41	58	10	42	59	10	43	60	12	44	61	12
	Through	45	72	8	46	73	8	47	74	10	48	75	10
Railway	Deck	49	70	S	50	71	D	51	72	T	52	73	S
	Pony	53	54	S	54	55	T	55	56	D	56	57	D
	Through	57	68	D	58	69	T	59	70	S	60	71	D
	Deck	61	62	T	62	63	S	63	64	S	64	65	T